moisture particles which collectively are known as fog. Fog is simply a cloud in contact with the land or the ocean.

As the summer type of fog is principally due to the mixing of air masses differing in relative humidity and in temperature, it seldom results in measurable precipitation. Air masses which ascend and therefore expand and cool produce precipitation much more effectively. Though it is foggy along the California coast about 50 per cent of the time during the summer months, practically no precipitation is recorded. Certain kinds of vegetation have, through a long-continued process of adapting themselves to their environment, learned to precipitate water from the fog. For example, the redwood (*Sequoia sempervirens*), one of the most typical of California trees, has so successfully learned the art of precipitating mositure from fog that such a grove is dripping wet during a fog. It is a significant fact that this tree is found only in a narrow belt along the coast, and never more than 30 miles inland. Recent determinations show that the amount of liquid water in the densest fogs is very small;[2] but large areas collect large amounts and perhaps some day irrigation will be aided by the use of some device for precipitating water from fog as successfully as the redwood tree does it.

Winter fog.—Winter fog is less common than the summer type, and differs from it also in being of land origin. It occurs in all portions of California, and occasionally moves seaward, though it does not often go far offshore. It is very superficial, usually being but 100 to 200 feet deep. However, it resembles the summer type of fog in that it requires a weak barometric gradient for its formation, and vigorous wind movement prevents it from forming. It can be anticipated during the winter when a large high pressure area impinges upon the coast, and subsequently moves slowly southeastward. In California it is locally known as "tule fog" as it is of most frequent origin over tule lands which are swamps and marshes filled with tule or Mexican bulrush of the genus Scirpa. During the night, when stagnant air lies in contact with moist ground it loses heat through radiation aloft and through conduction to the ground. If the lowering of temperature proceeds far enough, partial condensation results in the formation of a "tule fog." This fog will persist until it is dried up by the sun from above, or is laterally displaced by cyclonic wind movement. As a factor in navigation it is less dangerous than summer fog because it is less frequent, is very shallow, and is not found far offshore. Navigators can often avoid it by taking an outside course. Occasionally, a lookout stationed at the top of the mast can see over the fog stratum, thus largely removing the danger of running ashore.

In California and vicinity the barometric conditions of Summer are wholly different from those of Winter. So, too, are the fogs, which are largely dependent on barometric gradients and the resulting winds. While the summer type of fog occasionally occurs in winter, it is uncummon, because the Aleutian LOW then controls the weather of the North Pacific. The air is then cooler than the water, and contact between the two causes a rise in the temperatire of the air rather than a fall, and hence a tendency to dispel fog.

SUMMARY.

Fog is the principal contributing cause of most of the marine disasters along the coast of California. When a ship is wrecked through going ashore or by collision, it is usually during a period of fog. Fog prevails during a large part of the time, approximately 50 per cent of the summer months being foggy. Summer fogs originate over the ocean, are due primarily to the mixing of air masses differing in temperature and relative humidity, and coincide in extent largely with the upwelling of relatively cold water. Winter fogs, of land origin, are shallow in depth, and are caused by the cooling and partial condensation of the mositure in a stagnant mass of air lying in contact with moist ground. Both types of fog are associated with anticyclonic conditions, for they are dispelled by well-defined gradients and the resulting winds.

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RELATIVE FREQUENCY OF FOG AT UNITED STATES LIGHTHOUSES.[3]

UNITED STATES BUREAU OF LIGHTHOUSES.

Fog is more generally prevalent throughout the first district than any other, as shown by the following table, from which it will be seen that out of 29 stations in the entire service, averaging over 1,000 hours of fog per year, 14 or practically one-half are in that locality.

District.	Station.	Average hours of fog per year.	Length of record.	Per cent of fog based on entire period.
		Hours.	*Years.*	*Per cent.*
1	Petit Manan, Me.	1,691	31	19
1	Whitehead, Me.	1,544	31	18
1	Libby Islands, Me.	1,536	31	17
1	Matinicus Rock, Me.	1,399	31	16
1	Great Duck Island, Me.	1,384	25	16
1	West Quoddy Head, Me.	1,372	31	16
1	Moose Peak, Me.	1,356	3	15
1	Egg Rock, Me.	1,341	11	15
18	Point Reyes Light, Cal.	1,337	31	15
1	Seguin, Me.	1,331	31	15
1	Mount Desert, Me.	1,304	24	15
1	Little River, Me.	1,219	10	14
1	The Cuckolds, Me.	1,208	23	14
17	Swiftsure Bank Light Vessel, Wash.	1,203	9	14
12	Calumet Harbor, Ill.	1,196	9	14
1	Pollock Rip Slue Light Vessel, Mass.	1,175	14	13
18	Bonita Point, Cal.	1,143	31	13
1	Manana Island, Me.	1,116	31	13
18	Point Arena, Cal.	1,076	31	12
18	Blunts Reef Light Vessel, Cal.	1,065	10	12
2	Great Round Shoal Light Vessel, Mass.	1,064	23	12
1	Nash Island, Me.	1,063	10	12
2	Pollock Rip Light Vessel, Mass.	1,061	31	12
18	Point Cabrillo, Cal.	1,045	7	12
18	Humboldt, Cal.	1,037	7	12
18	San Luis Obispo, Cal.	1,027	25	12
2	Nantucket Shoals Light Vessel, Mass.	1,005	23	11
18	San Francisco Light Vessel, Cal.	1,004	18	11
2	Gloucester Breakwater, Mass.	1,002	4	11

[2] *United States Coast Guard.* International ice observation and ice patrol service in the North Atlantic Ocean, February to July, 1915. Washington, 1916, pp. 65–72. (U. S. Coast Guard, bulletin No. 5.)

[3] Quoted from *U. S. Bureau of Lighthouses.* The United States lighthouse service, 1915. Washington, 1916. 94 p. 8°. See p. 49.